Milltown Dam
On the Clark Fork River
Town of Milltown
Missoula County
Montana

HAER No. MT-43

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Rocky Mountain Regional Office
Department of the Interior
P.O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD
MILLTOWN DAM

I. INTRODUCTION

Location:	On the Clark Fork River approximately six miles up stream from Missoula, Montana and just below the mouth of the Blackfoot River. It is located in the NE1/4 of Section 20, T13NR18W.
Quad:	USGS Southeast Missoula
UTM:	Zone 12 - 279580 Easting, 5194740 Northing
Date of Construction:	1905-1908
Present Owner:	Montana Power Company Butte, Montana
Present Use:	Power generation
Significance:	The Milltown dam and power plant are significant for their association with W. A. Clark, one of the single-most important individuals in the economic and political history of Montana; for its association with the economic development of Missoula; and for its association with the development of hydro-electric resources in Montana.
Historian:	Fredric L. Quivik, November, 1984.

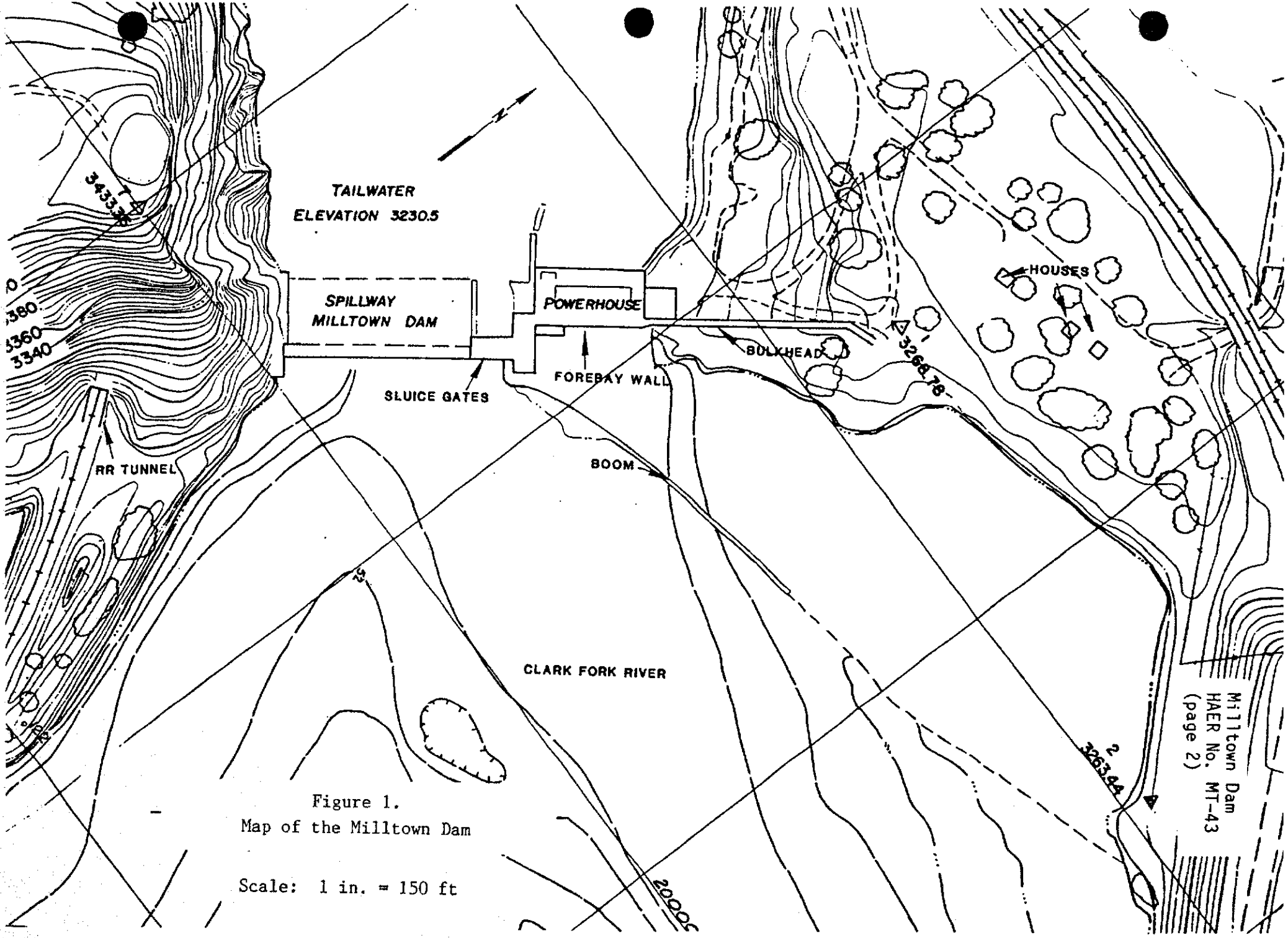

Figure 1.
Map of the Milltown Dam

Scale: 1 in. = 150 ft

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II. HISTORICAL NARRATIVE

A. BACKGROUND

The Milltown dam and power plant were built in 1905-1908 by the Clark-Montana Realty, one of numerous companies principally owned by William Andrews Clark, Butte Copper King and one of the most powerful men in turn-of-the century Montana economic and political life.

William Andrews Clark was born to a farm family in Fayette County, Pennsylvania, in 1839. When he was seventeen years old, his family moved to Iowa. There young Clark attended schools and also taught in the rural school district. In 1859, he moved to Missouri to teach. Word of the Colorado Gold Rush took him west in 1862 and he gained his initial mining experience at Central City, Colorado. The following year, Clark moved to Montana to try his luck in the gold fields around Bannack. In his first summer he earned $2000 and that sum became the germ of his future fortunes.[1]

Clark invested his money in supplies which he transported from Salt Lake City to the Montana mining camps and sold at a profit. By the late 1860s, this enterprising young man had established a partnership with an eastern capitalist in a wholesale business in Helena and had a contract to carry the mail from Walla Walla, Washington, to Missoula. In 1870, he moved his business to Deer Lodge and began purchasing gold from nearby miners for resale in the east and also began making loans to local businesses. This naturally led to banking. He formed the First National Bank of Deer Lodge in 1872. Through its several reorganizations in the

years to come, Clark's bank became one of the most solid banks in the United States.

With his bank as a financial base, Clark began investing in mines in the nearby mining camp of Butte. Butte had been a gold boom town in the 1860s, but by the 1870s it was in decline. Owners of claims knew that the Butte hill contained great mineral wealth, but they lacked the capital to develop the underground mines and Butte lacked adequate transportation connections for shipping equipment into the camp or ore out to processing facilities in the east. Consequently, Clark was able to acquire several Butte mines at very low prices. To better understand the new business he was about to enter, Clark took a year off from his Montana activities to study at the Columbia School of Mines in New York City. Upon his return to Butte he was able to develop his mines into some of the great producers of the mining world. Within a few years, Clark was one of the world's most wealthy men, and his Butte mines provided him the wealth to expand into other lucrative activities in Montana and elsewhere.

Besides mines, Clark also developed smelters in Butte. He owned the Butte Miner, one of Montana's leading daily newspapers. He developed the United Verde Copper Company in Arizona, another of the world's great producers, and he built a railroad from Los Angeles to Salt Lake City. He also developed a large lumber business in Western Montana, the Western Lumber Company. Most of his logging activity was centered around Missoula and in 1911, he built his mill at Milltown, adjacent to his dam on the Clark Fork River. In fact,

Missoula took second place to Butte as the scene of Clark's Montana investments. Besides the lumber mill and power plant, he owned a flour mill, the water and electric utilities, and the street railway system in Missoula.

B. ELECTRICAL AND INDUSTRIAL OEVELOPMENT AROUND MISSOULA

Before W. A. Clark began investing in Missoula, it had already become established as a major lumber and railroad center in western Montana as well as the home of the University of Montana.

The first major white presence in the Missoula area occurred when the Mullan Road was constructed between Fort Benton, Montana and Walla Walla, Washington in the 1850s. By the late 1850s, a few permanent settlers were beginning to farm in the Missoula valley. In 1860 the Worden and Company store was established, in the winter of 1864-1865 a sawmill was built, and in the summer of 1865 a grist mill was built. However, Missoula remained a remote frontier settlement until the Northern Pacific Railroad arrived in the early 1880s. Soon after the N.P.'s transcontinental line was complete, the railroad built a roundhouse and engine shops at Missoula, and Missoula became a division point for the railroad.[2]

Construction of the railroad required vast amounts of lumber for bridges and ties. To meet that demand, E. L. Bonner, A. B. Hammond, and R. A. Eddy built several sawmills in the Missoula area, one of which was located at what is now known as the town of Bonner. In 1882, at the urging of the Northern Pacific, these three men formed the Montana Improvement Company to cut western Montana timber, mill

it, and market it along the Northern Pacific line. The railroad owned half of the corporation's original $2 million of stock. One of the other founders of the company was Marcus Daly, founder of the Anaconda Company in Butte. He recognized the need for a ready supply of wood for mine timbers and for fuel in his smelters. The mill at Bonner became the major plant of the Montana Improvement Company.[3] At the time Clark built his dam, the company was known as the Big Blackfoot Milling Company. Soon thereafter, it was sold to the Anaconda Company which owned it until the 1970s.

Clark formed the Western Lumber Company in 1898 and incorporated the company on March 10, 1899. Officers were Clark, President; A. H. Wethey, Vice President; W. M. Bickford, Secretary, and H. W. McLaughlin, Director.[4] The first mill was built at Nine Mile, a location on the Clark Fort below Missoula. In 1900, a new mill was built at Lothrop, three miles below Nine Mile.[5] During the first few years of the 20th century, Clark acquired timber lands throughout Missoula County, especially in the areas up the Big Blackfoot River, from Robert F. Cobban. Cobban had moved to Missoula in 1899 from Butte where he had been Treasurer and Manager of the Cobban Loan and Realty Company, a major Butte real estate development firm.[6] In 1905, Cobban was investigated for land fraud. He was alleged to have arranged to buy parcels of timberland from individuals who had just previously filed claims for allotments on federal lands. This was in violation of federal law, since people making claims were to do so for their own use without intent to sell the land to a third party. Clark was

exonerated of any wrongdoing, claiming he had no knowledge that Cobban had acquired the lands fraudulently.[7]

Prior to the arrival of the Northern Pacific, several settlers farmed near the mouth of the Blackfoot River. When the Bonner mill was built one of those farmers, John McCormick, leased lots to some of the millworkers for their houses on land that was to become the Milltown townsite. In about 1904, McCormick sold that land to the Western Lumber Company. Clark's company subdivided the land into 30 ft x 130 ft lots and continued to lease the ground.[8] Initially, the community was called Riverside. Also in 1904, Clark's lieutenant, A. H. Wethey, acquired the land on which the power plant would sit and he acquired water rights on the Clark Fork and the Big Blackfoot sufficient to operate the power plant.[9] Having acquired a good site for a mill, with power available from his new generating plant, and with large timber holdings up the Blackfoot, Clark decided in 1910 that it would be advantageous to move his Western Lumber Company mill from Lothrop to Riverside. By 1911 the new mill was operating.[10]

As Missoula and its industries grew, so did their demand for electricity. Missoula's first electric generating facility was a steam powered plant installed in 1889 in the heart of town and operated by the Missoula Light and Power Company, owned by A. B. Hammond and C. H. McLeod who controlled the Missoula Mercantile Company. Shortly after the Bonner mill went into operation, a generating plant was built there on the Blackfoot River. It originally served only the mill, generating electricity by means of both a steam-powered

generator and a water powered turbine. This power plant also delivered mechanical power directly to the mill by means of a rope drive. In the ensuing years, the Missoula Light and Power Company took over the generating plant on the Blackfoot, enlarged its generating capacity, and built a transmission line from Bonner into Missoula. In 1905, the plant at Bonner had a dam with a head of 22 ft, two Leffel turbines which drove generators with a capacity of about 650 kw, and a steam engine capable of driving the generators in case water power was lost.[11] That year, Missoula Light and Water Company announced plans to enlarge the Bonner plant, but before any action was taken, W. A. Clark bought the company and announced that he was interested in building a new power generating facility of his own.[12]

The developments at Missoula closely followed the pattern of hydroelectric development throughout western Montana. Montana's abundant large rivers flowing out of the Rocky Mountains offered a great potential for power generation. However, because of lack of demand and transmission capabilities, early hydropower facilities in Montana were quite small and usually adjacent to the demand, an industrial or mining site or a town. Montana's copper mining industry changed all that. Around the turn of the century, engineers had developed the technology needed to transmit electricity over long distances. At about the same time, Montana's mining industry, mainly at Butte, Anaconda, and Great Falls, had generated the wealth needed to provide the capital to build large hydropower facilities. Furthermore, new mining and metallurgical technologies, such as electric pumps, ventilation systems, motors for producing compressed

air, and electrolytic refining, had generated the demand needed to justify the construction of large hydropower facilities.

The first large-scale hydropower facility in Montana was constructed at the Black Eagle Falls of the Missouri River at Great Falls in 1B91. It was followed by the Canyon Ferry Dam in 1B96, and the Big Hole power plant in 1900. The first decade of the new century saw several other large projects completed, the Hauser Lake Dam, Madison River Dam, Rainbow Falls Dam and Clark's Milltown Dam among them. The next decade saw more, even larger dams and power plants built. This massive development of hydropower potential in Montana contributed to the rapid industrialization of Montana, not only in the areas of mining and smelting, but in the timber industry and the electrification of railroads as well. This development also led to the widespread availability of electricity to the populations of Montana's cities and towns.[13]

C. DEVELOPMENT OF THE MILLTOWN DAM

Missoula first learned of Clark's plans in early January, 1906, when his representatives were in the area surveying the possibility of implementing an electric street railway system in Missoula. At that time, they also mentioned the possibility of a new dam and power plant at the old McCormick place near the mouth of the Blackfoot River.[14]

Missoula's first streetcar system was that of the Missoula Street Railway Company. It was granted a franchise to operate in Missoula in 1889 and began constructing its line the next year. However,

the company was fraught with difficulties and in 1897 it discontinued service.[15] In the first years of the 20th century, other companies talked about building a streetcar line in Missoula, but not until 1905 and Clark's investigations did it look like Missoula was likely to regain streetcar service. J. R. Wharton, manager of Clark's Butte Street Railway Company, and W. M. Bickford, Clark's attorney, examined the prospects, but recommended against a streetcar venture because Missoula's population was not yet large enough to support a streetcar system. Nevertheless, Clark indicated he wanted to go ahead with the plan so that he could increase demand for electricity from his proposed dam. By the spring of the year, Clark's engineers were on the proposed dam site making plans for construction.[16]

Even though construction of the dam began almost immediately, Clark's street railway system was still several years away. He received a franchise to operate in January of 1909. In February, he formed his new company, the Missoula Street Railway Company. Incorporators were Jesse R. Wharton of Butte, Sidney R. Inch of Missoula, W. A. Clark, Jr. of Los Angeles, Walter M. Bickford of Butte, and C. E. McBroom of Spokane. Construction began that year and in 1910 service commenced, managed by Inch who also managed Clark's Missoula Light and Water Company. The Missoula Street Railway Company was the first in the U.S. to initiate service using one-man crews on large double-track streetcars. Heretofore, all streetcar systems had employed two-man crews on their large cars.[17]

Construction on Clark's dam began in September, 1905, after a delay said to be due to his illness. Clark employed his own engineers and construction crews for the work. For example, draftsmen on the job included W. F. Waddell, a draftsman at Clark's Butte Reduction Works, and H. M. Ferguson, a draftsman at Clark's Missoula Light and Water Company. The construction superintendent was Jerry Rourke, Chief Engineer at Clark's Colusa-Parrot Mining and Smelting Company.[18] F. W. Kuphal, an employee of Clark's bank in Butte, moved his family to Missoula and assumed the duties of paymaster for the construction project. Expenditure ledgers for the Clark-Montana Realty Company show that individuals were hired rather than construction companies contracted for construction of the dam. Work on the dam proceeded until November, 1905. That month, Clark visited Missoula and reported that he was revising his plans and was going to enlarge the dam and power plant.[19]

Construction did not resume until the fall of 1906. Presumably, the enlargement of the dam was completed during low water that season and the powerhouse was built during low water of the next season. Structural steel for the powerhouse, fabricated by the Wisconsin Bridge and Iron Company was delivered during June and July, 1907. Turbines from the Leffel Company and electrical equipment from the General Electric Company were delivered late in the summer, 1907. George Slack was the superintendent of this latter phase of construction. The plant first generated electricty during a test run on January 9, 1908. Sidney R. Inch was put in charge of the electrical department of Clark's Missoula Light and Water Company.[20]

Clark's engineers do not appear to have utilized any new or unusual practices in the design and construction of the dam and powerhouse at Milltown. A search of the Engineering Index for the period during which the facility was built indicates that the project did not attract the attention of engineers around the U.S., even though numerous other hydroelectric facilities under construction in Montana at that time were noteworthy.[21] For example, timber crib, rock-filled dams were standard practice at the time. The Rainbow Falls Dam on the Missouri River near Great Falls attracted attention, in part because of its size. It was 1140 feet long, 116 feet wide, 28 feet tall, and developed a head at the powerhouse of 116 feet.[22] In contrast, Clark's dam was only 668 feet long including the forebay wall of the powerhouse and the bulkhead on the north side of the powerhouse. Because of the unconventional nature of his dam, Clark was concerned about its safety when he heard news of the failure of the Hauser Lake Dam on the Missouri River in April, 1908. He asked Samuel Hauser to send his engineer to inspect the Clark dam for safety, and with good cause.[23]

In early June of 1908, Montana was hit with the worst flooding in its history. High water poured over Clark's dam (even over the bulkhead dam north of the powerhouse) and flooded the powerhouse. In an effort to save the powerhouse from possibly being washed out by the flood, operators at the dam dynamited the south end of the dam. This allowed flood waters to pass through the dam, relieving pressure on the powerhouse. The condition of the dam was also of some concern to the citizens of Missoula, situated several miles downstream. On separate occasions during

the flood, two Missoula businessmen, Charles H. Marsh, a livery owner, and Fred T. Sterling of the Missoula Mercantile Company, visited the site and reported to The Missoulian that the dam appeared to be holding.[24] When the flood receded, the electrical generating equipment had to be dried and cleaned of mud before it was operable again. The dynamited section of the dam was rebuilt in 1908-1909 with similar timber crib, rock-filled construction, differing somewhat in the timber design and with the addition of a concrete core.[25]

Since the damage and repairs of 1908, the dam and powerhouse have sustained several changes, due to maintaining and updating the facility. In 1920, concrete sluice gates were constructed between the powerhouse and the spillway to allow water to be passed through the dam more easily.[26] In 1927, two more turbines and generators were installed giving the power plant a present capacity of 3400 kw.[27] The wood crib, rock-filled bulkhead north of the powerhouse was replaced by the present concrete gravity dam around 1930.[28] In the 1970s, several other changes have taken place. Among them are the replacement of the plank crest and a portion of the plank apron of the dam with concrete, the repair of a portion of the brick south wall of the powerhouse (damaged by a leak in the dam) with poured concrete and concrete block, and replacement of the wood towers of the suspension bridge with steel towers.[29]

D. CORPORATE OWNERSHIP OF THE PROPERTY

From the time Milltown Dam was built 1905-1907 to the time it was acquired by the Montana Power Company in 1929, it was owned by

various of W. A. Clark's companies. As mentioned above, the land on which the dam was built had been previously owned by local farmers. Some of this land was acquired by the Clark-Montana Realty Company and some of the land was acquired by A. H. Wethey (the General Manager of all of Clark's Montana interests) and later transferred to the Clark-Montana Realty Company. Besides land, Wethey made two other imporatnt acquisitions for the proposed dam of the Clark-Montana Realty Company. On December 11, 1904, he filed an appropriation for 12,000 cubic feet per second of water from the Blackfoot River;[30] and on September 21, 1905, he filed an appropriation for 24,000 cfs of water from the Clark Fork.[31]

The Clark-Montana Realty Company was incorporated on May 2, 1904. Incorporators were Clark and his son, W. A. Jr., A. H. Wethey, W. M. Bickford, and C. E. McBroom.[32] Bickford was a Clark attorney and McBroom was a Clark associate in Spokane.[33] It was a Washington corporation. On July 23, 1910, the Clark-Montana Realty Company sold the land, water rights, dam and powerhouse to the Clark-Missoula Power Company.[34]

The Clark-Missoula Power Company was incorporated on May 4, 1910, also in the state of Washington. Incorporators were Clark, Wethey, Bickford, McBroom, and J. K. Heslet[35], who was the Assistant Cashier at the W. A. Clark and Brother Bank.[36] On September 30, 1916, the Clark-Missoula Power Company sold the facility to the Missoula Light and Water Company. At the time of the sale, James C. Phillips, Auditor of Clark's properties, was an officer of the Clark-Missoula Power Company.[37]

The Missoula Light and Water Company was incorporated on August 26, 1906, also in the state of Washington. Incorporators were Clark, Wethey, Bickford, Heslet, and McBroom.[38] At least one other company appears to have existed under this name. In 1903, a Missoula Light and Water Company was incorporated in the state of Oregon. One of the officers was a G. B. McLeod of that state. He may have been a relative of C. H. McLeod, one of the owners of the Missoula Mercantile Company and President of the earlier Missoula Light and Power Company. A relationship between the Oregon corporation and the Missoula Mercantile interests can be seen in the certification of Fred T. Sterling, a Missoula Mercantile employee, as agent in 1904. A later relationship between the Oregon corporation and Clark's Missoula Light and Water Company can be seen in the certification of A. H. Wethey as agent in 1906.[39]

The Missoula Light and Water Company sold the Milltown power plant to the Missoula Public Service Company on October 31, 1924. At the time of the sale, Clark's auditor, J. C. Phillips, was again an officer of the company making the sale.[40] The Missoula Public Service Company was incorporated in the state of Montana on September 30, 1924. Incorporators were J. K. Heslet, William C. Siderfim, Fred J. Furman, Sydney Sanner, and J. L. Templeman, all of Butte.[41] Heslet was still Assistant Cashier at Clark Bank. Siderfin had been Wethey's assistant and replaced him as General Manager of Clark's interests around 1912. Furman, Sanner, and Templeman were all Butte lawyers.[42]

W. A. Clark died on March 2, 1925. His estate was divided among his surviving children. Most of his Montana mining and timber interests were sold to the Anaconda Company in 1928.[43] His Milltown dam and power plant were sold by the Missoula Public Service Company to the Montana Power Company on October 31, 1929.[44] The Montana Power Company was created on December 12, 1912, with the merger of four large Montana electric utilities, the Butte Electric and Power Company, the Missouri River Electric and Power Company, the Madison River Power Company, and the Billings and Eastern Montana Power Company. Each of these companies had acquired numerous smaller companies over the previous years.[45]

Formation of the Montana Power Company was largely the work of John D. Ryan, president of the Anaconda Company. He became president of the Montana Power Company as well, and headed both companies until his death in 1933.[46] In the years following the creation of Montana Power, that company continued to acquire other small electrical utilities and generating facilities around the western and central portions of Montana. With the acquisition of Clark's Milltown dam in 1929, the Montana Power Company owned almost all of the hydroelectric generating facilities in the state. The Milltown dam and power plant have been owned and operated by the Montana Power Company since that time.[47]

III. DESCRIPTION

A. INTRODUCTION

The Milltown dam and power plant site is comprised of several features including the main timber crib, rock-filled dam, the sluice gates, the powerhouse, a wing wall or bulkhead, related nearby features, the camp, and nearby structures not related to the power generating facility. Each of these are described separately.

B. THE SPILLWAY

The spillway section of the dam at the Milltown site is a 219.5 foot timber crib, rock-filled dam about 40 feet tall. The main structure of the spillway is part of the original construction with the exception of a section at the south end of the dam which was dynamited during the flood of 1908 and replaced soon thereafter. Certain exterior elements of the spillway, such as the sheathing of the apron, the crest, and the flashboards, have been replaced over time as part of routine maintenance. These changes have not significantly altered the configuration of the dam nor compromised its integrity.

The spillway was constructed by first driving timber pilings into the riverbed. Next, a crib of 10" x 10" timbers was built on the riverbed and secured to the pilings. The crib was then filled with rock from the site. The pilings served to help keep the dam in place during construction, but the dam is essentially a gravity dam: it resists the force of the reservoir behind it by the shear gravity of the rock fill in the cribs. After the cribs were filled, the

upstream face of the dam was decked with 2" and 3" planks; the crest and the apron were decked with solid 10" x 10" timbers and sheathed with 2" and 3" planks. This sheathing has been replaced over time, in some cases by new timber sheathing and, in the cases of the crest and the north end of the apron, with concrete. The south end of the dam adjoins a concrete abutment against the rock face of the south bank of the river. This concrete abutment is not original. It may have been built at the time the wing wall north of the powerhouse was built. The north end of the spillway abuts the sluice gates.

The crest of the dam features 68 beartrap-type flashboards which allow the level of water in the reservoir to be raised and lowered. The flashboards, when in the raised position assume an A-frame configuration. Each upstream leg is comprised of two upright wide-flange steel sections supporting a plank face. Each downstream leg is comprised of four 4" x 4" timbers and a plank face. The upstream leg is hinged to the top of the crest and the downstream leg sits in a slot which runs the full length of the dam. During high water, the flashboards are dropped by individually pulling the downstream legs out of the slot, thus allowing the flow of the river to lay each flashboard flat on the crest. During low water, beginning about July 1 each year, the flashboards are raised by lifting each one and setting its downstream leg in the slot. The flashboards are usually only dropped during spring runoff and are in the raised position the rest of the year. The present flashboards are about 8 feet tall. The

original flashboards were about 5 feet tall. They allow the reservoir to be raised about 8 feet, thus increasing the head at the powerhouse and the generating potential of the system.

Spanning the spillway is a pedestrian suspension bridge. It is supported by two steel I-beam towers which replaced wood towers in 1973. The suspension bridge is comprised of two steel catenary cables, a series of steel suspension cables, timber floor beams, and a plank deck. The bridge is without stiffening.

In June, 1908, flood waters threatened the dam and powerhouse. (The flood of 1908 washed out bridges, railroad lines, and other property around Missoula County and the state of Montana. It is the worst flood in Montana's history.) To relieve pressure on the dam and powerhouse, the south end of the spillway was dynamited. The missing sections of the spillway were reconstructed in 1908-1909. Once installed and sheathed, the replacement sections could not be distinguished from the rest of the spillway.

The spillway is old and deteriorating. As already mentioned, several sections have been repaired with concrete.

C. THE SLUICE GATES

The concrete sluice gate section of the dam complex is 52 feet long. This section was also originally a timber crib, rock-filled structure. It was replaced with the present concrete structure in 1920 to allow dam operators to pass water through

the dam more easily, especially during high water. This concrete structure sits on part of the original timber crib rock-filled dam.

The concrete structure contains four sluice gates (also called flood gates). Each 9' x 14' steel gate is opened and closed by a steel threaded stem, a gear box, and an electric motor housed overhead. Three of the gates are for controlling the reservoir level and the fourth, closest to the powerhouse, has an elbow entrance which carries water from the forebay. Just downstream of this elbow entrance is a 3' wier which facilitates the draining of the forebay floor.

On the platform above and adjacent to the sluice gates is a metal storage or tack house built around 1974. It replaced an earlier wood frame structure.

D. THE POWERHOUSE

The powerhouse is a brick and reinforced concrete structure, 126 feet long and 65 feet wide. The upstream side or forebay wall of the powerhouse is actually a part of the dam. It is a concrete gravity section, 152 feet long, 51 feet tall, 4 feet wide at the top, about 18' wide at the base, and with a vertical upstream face. The forebay wall has eight penstock openings, six 10' diameter openings for the main operator penstocks and two 5' diameter openings for the exciter penstocks. The forebay wall is reinforced by steel frame buttresses embedded in concrete which sit on the walls of the concrete discharge tunnels below.

The concrete structure of the discharge tunnels provides the foundation for the powerhouse. Concrete walls of the discharge tunnels are 30" thick. The discharge tunnels under the main generators are 18' on center; the discharge tunnel under the exciters is 14' on center. The concrete floor of the powerhouse forms the ceiling of the discharge tunnels. The floor is reinforced with steel I-beams running perpendicular to the tunnel walls. Double I-beams reinforce the floor under the supports for the generating equipment.

The other three walls of the powerhouse are 18" thick brick bearing wall construction (American bond) with integral brick pilasters at the bay divisions defined by the tunnel walls below. The west or downstream wall of the powerhouse has seven windows, each with a full semi-circular brick arched opening, a multi-light transom, and a pair of 9/9 double-hung sash. Each end wall has door openings at the ground level and three window openings above. Windows in the end walls have 12/12 double-hung sash. All end wall openings have segmental brick arches. A metal machine shop addition with a gable roof was constructed at the north end of the powerhouse in about 1973. Also during the 1970s, a section of the south wall adjacent to the forebay wall was replaced (due to damage from a leak in the forebay wall) by reinforced concrete and concrete block.

The brick end walls extend upward to form the gable ends of the powerhouse. The gable roof is supported by steel Fink trusses with additional truss work to accommodate the roof monitor. Each

truss spans 59' 10" and is supported on the top of the fore-bay wall at its east end, at the top of a brick pilaster at its west end. Two inch tongue and groove roof decking is nailed to wood nailers (3" x 3") which are bolted to steel C-section purlins. The roof monitor has a series of 12-lite fixed sash on both the east and west sides. The entire roof is sheathed with corrugated metal roofing.

The powerhouse is equipped with five General Electric alternating current generators and two General Electric direct current exciters, all powered by Leffel twin horizontal turbines with central discharge. Generators 1, 3, and 4 and both exciters were installed when the plant was built. Generators 2 and 5 were installed in 1927. Generators 2 and 5 and the exciters are still equipped with their original Woodward governors. Generators 1, 3 and 4 were originally installed with Lombard governors which were replaced by electronic controls in about 1973. Other than the replacement of parts during routine maintenance, all the generators and exciters are in original condition. Other than the replacement of shafts and other routine repairs, all of the Leffel turbines are in original condition. The plant is capable of peak generation of 3400 kilowatts. A sixth penstock at the north end of the building has a riveted steel thimble connecting it directly to its discharge tunnel. A sixth turbine and generator were never installed at this location.

Water supply to the turbines is controlled by timber head gates. The original timber gate stems were replaced with steel gate stems

and the gates rebuilt in 1958. The original timber stem structure is still in place at penstock 6, the unused penstock. The penstock gates are opened and closed by means of cogs driven by worm gears and a line shaft delivering power from a single motor located near the center of the top of the forebay wall. The penstock gates and all the drive mechanisms are exterior to the buildings. Small debris is prevented from entering the penstocks by a trash screen structure supported by a steel I-beam support system which extends into the forebay from the vertical face of the forebay wall.

Originally, the Milltown Dam supplied current to several local circuits including the Bonner Mill, the towns of Bonner and Milltown, a Missoula circuit, and a rural circuit. Switches for these various circuits were housed in a brick support structure located at an upper level of the southwest corner of the powerhouse. The switching gear was removed around 1975 but the brick support structure is still in place. Now, power from the plant is fed into the MPC grid at a substation at the Bonner Mill. Prior to 1975, electrical generation was controlled at the Milltown Dam. Now it is controlled remotely from Butte. At present, the only controls for each machine, located on a control board along the west wall of the powerhouse, are field switches to excite each main generator and overcurrent and undercurrent relays to protect the equipment from lightning and shorts. Originally the powerhouse was equipped with six water-cooled transformers. They were replaced in about 1974 by three air-cooled transformers.

The powerhouse is equipped with a ten-ton overhead crane manufactured by Maris Brothers of Philadelphia. A small wood frame office with ample windows sits on the main floor of the powerhouse in front of the two exciters and between generators 2 and 3.

E. THE WING WALL

A 244-foot concrete wing wall extending from the powerhouse to the north bank of the reservoir completes the overall dam complex. It is a conventional concrete gravity dam. It was built in front of the original timber crib, rock-filled wing wall, or bulkhead, in 1930.

F. RELATED ELEMENTS OF THE DAM SITE

Several other related structures are found at the site. The most significant include a 900-foot boom above the forebay, the ruins of a concrete training wall, and the remains of a bridge pier. The boom is in two sections: a 400-foot pipe boom installed in about 1974 which floats at the head of the forebay to prevent logs and other large debris from entering the forebay, and a 500-foot wood boom which is now grounded on the silt which has filled the reservoir.

A broken section of a concrete training wall is all that remains of a structure which was intended to prevent spillage over the spillway from increasing tailwater levels below the powerhouse. However, the river has undercut the training wall, causing it to break away

in sections. The concrete training wall replaced an earlier timber crib, rock-filled wall which extended all the way to the Northern Pacific trestle below the dam. The remains of the bridge pier are all that is left of a causeway from the north bank of the river to the training wall.

G. THE CAMP

On the banks on the north side of the reservoir is the camp - the collection of houses built by the Clark-Montana Realty Company for employees at the power plant. There are at present three houses standing, all of which were built before 1921. They probably date to the beginning of the operation of the power plant.

The house closest to the powerhouse is different from the other two. It is a one-story L-shaped wood frame structure with beaded novelty siding and a gable roof with asphalt shingles. It sits on a concrete foundation and its overall dimensions are 27' x 35'. Windows are 1/1 double hung sash. Adjacent to the street are a shed and a garage, both wood frame with gable roof.

The house on the next lot was demolished in about 1978 to make room for a picnic shelter. It was a hipped-roof house like those on lots 3 and 4. The picnic shelter, a simple gable roof structure supported by 3" steel pipe columns, was built in about 1982. A shed still stands on this lot adjacent to the street.

The houses on lots 3 and 4 are identical. They are one-story wood-frame, four-square hipped roof houses with lapped siding and con-

crete foundations. Their overall dimensions are 29' x 39'. They are each fronted by a hipped roof porch supported by a small outdoor closet to the east and a turned post to the west. Windows are 1/1 double-hung sash. Both a shed and a garage remain on lot 3; only the shed remains on lot 4.

H. NEARBY STRUCTURES

Two other historic structures were noted within view of the damsite. A concrete tunnel constructed by the Chicago, Milwaukee, St. Paul, and Pacific Railroad goes through the rock ridge to which the south end of the dam abuts. It was built when the C.M.S.P.& P. was constructed across Montana in 1907-1909. The line was abandoned in 1980 and the track has been recently taken up. A steel riveted Warren deck truss bridge built by the Northern Pacific Railroad in about 1909 crosses the Clark Fork several hundred yards below the dam. It is still used by the Burlington Northern Railroad.

IV. FOOTNOTES

1. For a general chronology of W. A. Clark's life and career, see Helen Fitzgerald Sanders, History of Montana (Chicago: Lewis Publishing Company, 1913, pp. 854-860. For an assessment of Clark's life and career, see Michael P. Malone, The Battle for Butte (Seattle: University of Washington Press, 1981), pp. 12-15, 82-83, 200, and Malone.

2. M. A. Leeson, History of Montana: 1739-1885 (Chicago: Warner, Beers and Company, 1885), pp. 851-856.

3. K. Ross Toole, Montana: An Uncommon Land (Norman: University of Oklahoma Press, 1959), p. 160.

4. Corporate life for the Western Lumber Company at the Secretary of State's Office, State Capitol, Helena, Montana.

5. Bonner School Bicentennial Committee, A Grass Roots Tribute: The Story of Bonner, Montana (Missoula: Gateway Printing and Litho, 1976), P. 65.

6. Polk's Butte City Directory, 1898 and 1899, listings under R. F. Cobban.

7. The Missoulian, January 10, 1905, p. 1.

8. Bonner School, pp. 49-50.

9. Book 36, p. 93, Deed Records, Clerk and Recorder's Office, Missoula County Courthouse, Missoula, Montana.

10. Bonner School, p. 65.

11. Bonner School, p. 71. 1902 Sanborn Fire Insurance Map for Missoula, Montana. The Missoulian, January 1, 1905, Special Holiday Edition, p. 10.

12. The Missoulian, June 19, 1905, p. 2. Bonner School, p. 72.

13. S. W. Bird, The Story of Montana Power (Butte: MPC, 1941), pp. 64-77.

14. The Missoulian, January 3, 1905, p. 3.

15. Ira L. Swett, "Montana's Trolleys-111", Interurbans Magazine, Vol. 27, No. 1, Spring 1970, p. 63.

16. The Missoulian, January 12, 1905, p. 4.

17. Swett, pp. 64, 70.

18. Construction plans on file at the Milltown Powerhouse. Expenses log of the Clark-Montana Realty Company for construction of the facility on file at the Montana Power Company. Polk's Butte City Directory, 1906, listings for Waddell and Rourke. Polk's Missoula City Directory, 1911, listing for Ferguson. The Missoulian, September 13, 1905, p. 2; September 15, 1905, p. 2.

19. Butte Miner, November 28, 1905, p. 1.

20. Expenses logs for the Clark-Montana Realty Company. The Missoulian, January 10, 1908, p. 1.

21. The Engineering Index for the years 1900-1911 was consulted.

22. "The Construction of the Rainbow Falls Hydro-electric Development," Engineering Record, March 2, 1910.

23. Alan Newell, "A Victim of Monopoly: Samual T. Hauser and Hydroelectric Development on the Missouri River, 1898-1912, "M.A. Thesis, University of Montana, Missoula, 1979, pp. 88, 89.

24. The Missoulian, June 7, 1908, p. 12; June 8, 1908, p. 1.

25. Bonner School, p. 72.

26. Bonner School, p. 72. 1921 Sanborn Fire Insurance Map for Bonner.

27. Interview with Emmett (Smitty) Smith at the Milltown generating facility, November 9, 1984.

28. Construction documents on file at the Milltown powerhouse.

29. Emmett Smith.

30. Vol. D, p. 423, Water Rights Records, Clerk and Recorder's Office, Missoula County Courthouse, Missoula, Montana. Polk's Butte City Oirectory, 1906, listing for A. H. Wethey.

31. Vol. D, p. 450, Water Rights Records, Missoula County Courthouse, Missoula, Montana.

32. Corporate file for the Clark Montana Realty Company at the Office of the Secretary of State, State Capitol, Helena, Montana.

33. Polk's Butte City Directory, 1906, listing for Bickford, Clark-Montana Realty Company.

34. Book 57, p. 1687, Deed Records, Clerk and Recorder's Office, Missoula County Courthouse, Montana.

35. Corporate file for the Clark-Missoula Power Company at the Office of the Secretary of State, State Capitol, Helena, Montana.

36. Polk's Butte City Directory, 1909, listing for Heslet.

37. Book 80, p. 412, Deed Records, Clerk and Recorder's Office, Missoula County Courthouse. Polk's Butte City Directory, 1912, listing for Phillips.

38. Corporate file for the Missoula Light and Water Company (Washington) at the Office of the Secretary of State, Helena, Montana.

39. Corporate file for the Missoula Light and Water Company (Oregon) at the Office of the Secretary of State, Helena, Montana.

40. Book 102, p. 154, Deed Records, Clerk and Recorder's Office, Missoula County Courthouse, Montana.

41. Corporate file for the Missoula Public Service Company at the Office of the Secretary of State, Helena, Montana.

42. Polk's Butte City Directory, 1925, listings for Heslet, Siderfin, Furman, Sanner, and Templeman.

43. Malone, The Battle for Butte, p. 200.

44. Book 108, p. 583, Deed Records, Clerk and Recorder's Office, Missoula County Courthouse, Montana.

45. Bird, The Story of Montana Power, p. 38.

46. Michael P. Malone and Richard B. Roeder, Montana: A History of Two Centuries (Seattle: University of Washington Press, 1976), p. 247.

47. Bird, The Story of Montana Power, p. 39-44.

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ADDENDUM TO:
MILLTOWN DAM
Clark Fork River, 6 miles upstream from Missoula
Milltown
Missoula County
Montana

HAER MT-43
MONT,32-MILTO,1-

PHOTOGRAPHS

PAPER COPIES OF COLOR TRANSPARENCIES

HISTORIC AMERICAN ENGINEERING RECORD
INTERMOUNTAIN REGIONAL OFFICE
National Park Service
U.S. Department of the Interior
12795 West Alameda Parkway
Denver, CO 80228